

**SUN SCREEN DEVICE WITH A FLEXIBLE SCREEN BODY THAT CAN
BE ARBITRARILY ADJUSTED**

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

5 The invention relates to a sun screen device, more particularly to a sun screen device with a flexible screen body that can be arbitrarily adjusted.

2. DESCRIPTION OF THE RELATED ART

10 A conventional sun screen device, which is used for covering and uncovering a sun roof of an automobile, includes a pair of elongate slide rails, first and second shaft units, and first and second screen units.

15 Each of the slide rails extends in a first direction, and has first and second rail ends that are opposite to each other in the first direction. The slide rails are spaced apart from each other in a second direction. The first end of each of the slide rails is formed with a first positioning groove. The second end of each of the slide rails is formed with a second positioning
20 groove.

25 The first shaft unit is disposed proximate to the first rail ends of the slide rails. The first shaft unit includes a first pair of seat members that are spaced apart from each other in the second direction, and a first shaft member that extends in the second direction and that has opposite shaft end portions mounted rotatably and respectively on the first pair of seat

members, and a middle shaft portion between the shaft end portions of the first shaft member.

Similarly, the second shaft unit is disposed proximate to the second rail ends of the slide rails.

5 The second shaft unit includes a second pair of seat members that are spaced apart from each other in the second direction, and a second shaft member that extends in the second direction and that has opposite shaft end portions mounted rotatably and respectively on the
10 second pair of seat members, and a middle shaft portion between the shaft end portions of the second shaft member.

The first screen unit includes a first flexible screen body and a first operating member. The first flexible screen body has a securing end that is secured to the
15 first shaft member, and a terminating end that is opposite to the securing end and that is movable in the first direction along the slide rails. The first operating member is connected to the terminating end of the first screen body, extends in the second direction, and has
20 first and second ends coupled slidably and respectively to the slide rails. Each of the first and second ends of the first operating member is formed with a positioning protrusion.

Similarly, the second screen unit includes a second
25 flexible screen body and a second operating member. The second flexible screen body has a securing end that is secured to the second shaft member, and a terminating

end that is opposite to the securing end and that is movable in the first direction along the slide rails. The second screen body has a mesh size different from that of the first screen body. The second operating member
5 is connected to the terminating end of the second screen body, extends in the second direction, and has first and second ends coupled slidably and respectively to the slide rails. Each of the first and second ends of the second operating member is formed with a positioning
10 protrusion.

In operation, when it is desired to cover the sun roof of the automobile, the first (or second) operating member is moved such that the terminating end of the first (or second) screen body moves in the first direction
15 along the slide rails away from the first (or second) shaft unit. Then, the positioning protrusions of the first (or second) operating member are engaged respectively to the second (or first) positioning grooves in the slide rails. At this time, when it is
20 desired to uncover the sun roof of the automobile, the positioning protrusions of the first (or second) operating member are disengaged respectively from the second (or first) positioning grooves in the slide rails. Then, the first (or second) operating member is moved
25 such that the terminating end of the first (or second) screen body moves in the first direction along the slide rails toward the first (or second) shaft unit.

Although the aforementioned conventional sun screen device achieves its intended purpose, since the operating members of the screen units can only be positioned such that the first (or second) screen body
5 either fully covers or fully uncovers the sun roof of the automobile, it is not feasible to arbitrarily control the amount of sunlight passing through the sun roof of the automobile when the aforesaid conventional sun screen device is in use.

10 **SUMMARY OF THE INVENTION**

Therefore, the object of the present invention is to provide a sun screen device that can overcome the aforesaid drawback of the prior art.

According to the present invention, a sun screen
15 device comprises a pair of elongate slide rails, a shaft unit, a screen unit, a pair of cord units, and a pair of torque transmission members. Each of the elongate slide rails extends in a first direction, and has first and second rail ends that are opposite to each other
20 in the first direction. The slide rails are spaced apart from each other in a second direction. The shaft unit is disposed proximate to the first rail ends of the slide rails. The shaft unit includes a pair of seat members and a shaft member. The seat members are spaced apart
25 from each other in the second direction. The shaft member extends in the second direction, and has opposite shaft end portions mounted rotatably and respectively on the

seat members, and a middle shaft portion between the shaft end portions. The screen unit includes a tubular roller and a flexible screen body. The tubular roller is sleeved coaxially on and is coupled co-rotatably to the middle shaft portion of the shaft member. The flexible screen body has a securing end secured to the tubular roller, and a terminating end opposite to the securing end. The terminating end of the screen body is movable in the first direction along the slide rails. Each of the cord units includes a cord spool mounted rotatably on a respective one of the shaft end portions of the shaft member, a pulley mounted rotatably on the second rail end of a respective one of the slide rails, and a pull cord wound on the cord spool, trained on the pulley, and connected to the terminating end of the screen body. Each of the torque transmission members has a first end coupled co-rotatably to the tubular roller, and a second end coupled co-rotatably to the cord spool of a respective one of the cord units. When the terminating end of the screen body is moved in the first direction along the slide rails away from the shaft unit, this results in unwinding of the screen body from the tubular roller, rotation of the tubular roller in a first angular direction, and rotation of the cord spools of the cord units in the first angular direction due to torque transmitting action of the torque transmission members. Accordingly, the pull cords of the cord units are wound

on the cord spools. On the other hand, when the terminating end of the screen body is moved in the first direction along the slide rails toward the shaft unit, this results in unwinding of the pull cords of the cord units from the cord spools, rotation of the cord spools in a second angular direction opposite to the first angular direction, and rotation of the tubular roller in the second angular direction due to the torque transmitting action of the torque transmission members. Accordingly, the screen body is wound on the tubular roller.

BRIEF DESCRIPTION OF THE DRAWINGS

Other features and advantages of the present invention will become apparent in the following detailed description of the preferred embodiment with reference to the accompanying drawings, of which:

Figure 1 is a perspective view of the preferred embodiment of a sun screen device according to the present invention;

Figure 2 is a partly sectional view of the preferred embodiment;

Figure 3 is a partly sectional view of the preferred embodiment to illustrate a flexible screen body being moved in a first direction;

Figure 4 is a partly sectional view of the preferred embodiment to illustrate the flexible screen body being unwound from a tubular roller;

Figure 5 is a partly sectional view of the preferred embodiment to illustrate the flexible screen body being moved in a second direction; and

5 Figure 6 is a partly sectional view of the preferred embodiment to illustrate the flexible screen body being wound on the tubular roller.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to Figures 1 and 2, the preferred embodiment of a sun screen device according to this invention is shown to include a pair of elongate slide rails 2, a shaft unit 3, a screen unit 4, a pair of cord units 5, and a pair of torque transmission members 6.

15 The sun screen device is adapted to be mounted beneath and is operable so as to block sunlight passing through a sun roof (not shown) of an automobile (not shown).

Each of the slide rails 2 extends in a first direction, and has first and second rail ends 21, 26 that are opposite to each other in the first direction. The slide rails 2 are spaced apart from each other in a second direction transverse to the first direction.

20 The shaft unit 3 is disposed proximate to the first rail ends 21 of the slide rails 2. In this embodiment, the shaft unit 3 includes a pair of seat members 31 that are spaced apart from each other in the second direction, and a shaft member 32 that extends in the second direction and that has opposite shaft end portions 321, 322 mounted rotatably and respectively on the seat members 31, and

a middle shaft portion 323 between the shaft end portions 321, 322.

The screen unit 4 includes a tubular roller 41, a flexible screen body 43, a pair of coupling members 42, and an elongate operating member 44. The tubular roller 41 is sleeved coaxially on and is coupled co-rotatably to the middle shaft portion 323 of the shaft member 32. The flexible screen body 43 has a securing end 431 that is secured to the tubular roller 41, and a terminating end 432 that is opposite to the securing end 431 and that is movable in the first direction along the slide rails 2. The coupling members 42 are disposed in the tubular roller 41 and serve to couple co-rotatably the tubular roller 41 to the middle shaft portion 323 of the shaft member 32. The operating member 44 is connected to the terminating end 432 of the screen body 43, extends in the second direction, and has opposite ends coupled slidably and respectively to the slide rails 2.

Each of the cord units 5 includes a cord spool 51, a pulley 52, and a pull cord 53. The cord spool 51 of each of the cord units 5 is mounted rotatably on a respective one of the shaft end portions 321, 322 of the shaft member 32. The pulley 52 of each of the cord units 5 is mounted rotatably on the second rail end 26 of a respective one of the slide rails 2. The pull cord 53 of each of the cord units 5 has a winding section that is connected to and that is wound on the cord spool

51, an intermediate cord section that extends from the winding section and that is trained on the pulley 52, and a connecting section that extends from the intermediate cord section and that is connected to the operating member 44 of the screen unit 4 such that the pull cords 53 are connected indirectly to the terminating end 432 of the screen body 43 via the operating member 44.

Each of the torque transmission members 6 is a spiral spring member that is sleeved on the shaft member 32 and that is disposed in the tubular roller 41. In particular, each of the torque transmission members 6 has a first end 61 connected to a respective one of the coupling members 42 to couple co-rotatably with the tubular roller 41, and a second end 62 coupled co-rotatably to the cord spool 51 of a respective one of the cord units 5. Preferably, the torque transmission members 6 are pre-tensioned so as to maintain the screen body 43 and the pull cords 53 in a tautened state.

In operation, referring to Figures 3 and 4, when an external force is applied to the operating member 44 such that the terminating end 432 of the screen body 43 moves in the first direction along the slide rails 2 away from the shaft unit 3, as indicated by arrow (A), the screen body 43 unwinds from the tubular roller 41. This results in rotation of the tubular roller 41 in the first angular direction, as indicated by the arrow

(B), which in turn, rotates the cord spools 51 of the cord units 5 in the first angular direction due to torque transmitting action of the torque transmission members 6. Accordingly, the pull cords 53 of the cord units 5 are wound on the cord spools 51.

Conversely, referring to Figures 5 and 6, when an external force is applied to the operating member 44 such that the terminating end 432 of the screen body 43 moves in the first direction along the slide rails 2 toward the shaft unit 3, as indicated by arrow (C), the pull cords 53 of the cord units 5 unwind from the cord spools 51. This results in rotation of cord spools 51 in a second angular direction opposite to the first angular direction, as indicated by arrow (D), which in turn, rotates the tubular roller 41 in the second angular direction due to the torque transmitting action of the torque transmission members 6. Accordingly, the screen body 43 is wound on the tubular roller 41.

It is noted that when the operating member 44 is released from the external force, the pre-tensioned torque transmission members 6 do not serve to wind the screen body 43 on the tubular roller 41 and only serve to prevent slackening of the screen body 43 and the pull cords 53. Therefore, the screen body 43 can be arbitrarily adjusted. As such, the amount of sunlight passing through the sun roof of the automobile can be controlled.

While the present invention has been described in

connection with what is considered the most practical and preferred embodiment, it is understood that this invention is not limited to the disclosed embodiment but is intended to cover various arrangements included
5 within the spirit and scope of the broadest interpretation so as to encompass all such modifications and equivalent arrangements.